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ABSTRACT

This publication reports on the changes in federal and non-federal support for academic research and development (R&D) over the past three decades. The report describes major funding sources for overall academic research and development and sources of support by the science and engineering field. (YDS)

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Changes in Federal and Non-Federal Support for Academic R&D Over the Past Three Decades

by

Alan I. Rapoport

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CHANGES IN FEDERAL AND NON-FEDERAL SUPPORT FOR ACADEMIC R&D OVER THE PAST THREE DECADES

by Alan I. Rapoport

Adequate financial support for research and development (R&D) activities at U.S. colleges and universities is essential. It enables academic scientists and engineers to conduct world-class research. The patterns of this support have been changing over the past several decades, as the various sources have shifted their financial backing both overall and of specific science and engineering (S&E) fields. Inflation-adjusted academic R&D spending rose by 240 percent between 1972 and 2000 (from $8.3 billion to $28.1 billion). Federal financing of academic R&D grew by 180 percent during this period (from $5.6 billion to $16.3 billion), and academic R&D funds from non-Federal sources increased almost 350 percent (from $2.6 billion to $11.7 billion). This InfoBrief compares the roles of the Federal Government and non-Federal sources in supporting overall academic R&D and academic R&D in specific S&E fields and examines how these roles have changed over the past three decades.[1]

Major Funding Sources for Overall Academic R&D

The five academic R&D funding sources (for which data are available) are the Federal Government, state and local governments, industry, academic institutions, and other sources. Over the past three decades, the relative roles of these sources have changed considerably, with both the Federal and state and local governments playing a diminishing role, and industry and academic institutions increasing their share of support (figure 1).

Although the Federal Government continues to provide the majority of academic R&D funds, its share declined during the past three decades, while the shares financed by industry and academic institutions increased.

- The Federal Government still provides the majority of funds for R&D performed at academic institutions. In 2000, it accounted for 58 percent ($16.3 out of $28.1 billion) of all academic R&D funding. However, the Federal share declined fairly steadily from the early 1970s through 2000, dropping from 68 percent in 1972.

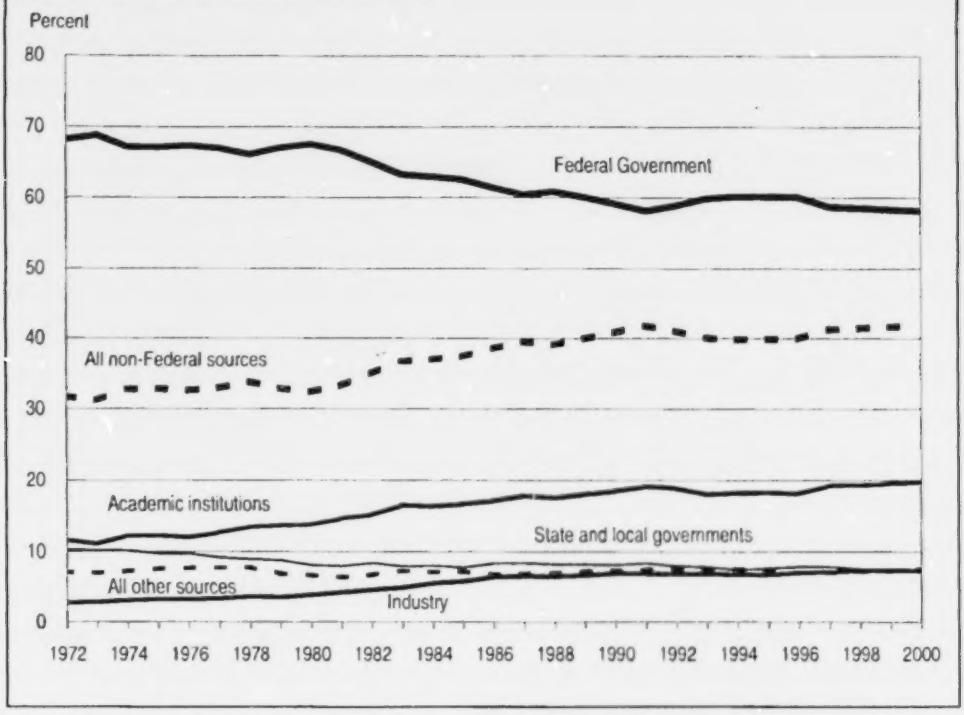
- The share of academic R&D funding provided by state and local governments[2] also declined fairly steadily during this period, dropping from 10 percent in 1972 to 7 percent in 2000.

[1]The analysis is based on statistics from the National Science Foundation's annual Survey of Research and Development Expenditures at Universities and Colleges. For a more detailed discussion of academic R&D, see chapter 5, "Academic Research and Development," in National Science Board, *Science and Engineering Indicators—2002*, NSB-02-1 (Arlington, VA: National Science Foundation, 2002).

[2]This category includes funds directly targeted to academic R&D activities by state and local governments. Excluded are general-purpose state or local government appropriations that academic institutions designate and use for separately budgeted research or to cover unreimbursed indirect costs or cost sharing.

Information and data from SRS—the Division of Science Resources Statistics—are available on the web at: <http://www.nsf.gov/sbe/srs/>. For more information about obtaining reports, contact paperpubs@nsf.gov or call 301-947-2722. For NSF's Telephonic Device for the Deaf, dial 703-292-5090.

Figure 1. **Sources of academic R&D funding**



SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, various years.

- Funds from academic institutions—institutional funds—constitute the second largest source ($5.5 billion) of academic R&D funding.[3] The share of support represented by institutional funds has been increasing fairly steadily since the early 1970s, except for a brief downturn in the early 1990s; specifically, it has risen from 12 percent in 1972 to 20 percent in 2000.

- Although industrial support still accounts for a small share of funding ($2.0 billion), its share rose faster than that of any other source during the past three decades, more than doubling from 3 percent in 1972 to 7 percent in 1990—the level where it remains.

- The share of funds from all other sources[4] has fluctuated between 6 and 8 percent over the past three decades.

Although relative shares changed during the 1972–2000 period, the amount of academic R&D funds provided by each of the five major funding sources increased in constant dollars (table 1). During the overall 1972–2000

[3]Institutional funds encompass three categories: separately budgeted funds from unrestricted sources that an academic institution spends on R&D, unreimbursed indirect costs associated with externally funded R&D projects, and mandatory and voluntary cost sharing on Federal and other grants. Institutional funds may be derived from (1) general-purpose state or local government appropriations (particularly for public institutions) or Federal appropriations; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income; and (5) unrestricted gifts. Other potential sources of institutional funds are income from patents or licenses and income from patient care revenues.

[4]This category of funds includes grants for R&D from nonprofit organizations and voluntary health agencies and gifts from private individuals that are restricted by the donor to the conduct of research, as well as other sources restricted to research purposes not included in the other categories.

Table 1. **Sources of academic R&D funding**

Year	Total	Federal Government	State and local government	Industry	Institutional	Other
	(Millions of constant 1996 dollars)					
1972	8,267	5,641	847	234	958	586
1980	10,629	7,185	861	413	1,465	706
1990	18,826	11,141	1,531	1,303	3,475	1,377
2000	28,085	16,343	2,059	2,035	5,535	2,113

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, various years.

period and in each of the three decade periods (1970s, 1980s, and 1990s), funds from industry grew fastest, followed by those from institutional sources. Funds from state and local government sources grew slowest during the overall period and during both the 1970s and 1990s; in the 1980s, however, funds from the Federal Government grew slower than those from the other four sources.

Sources of Support by S&E Field

The relative shares of Federal and non-Federal funding of academic R&D vary by science and engineering field, as do the absolute levels of funding (table 2).[5] In 2000, physical sciences; psychology; mathematics; computer sciences; biological sciences; earth, atmospheric, and ocean sciences; and medical sciences received between 60 and 70 percent of their support from the Federal Government. Engineering received 56 percent of its funds from the Federal Government; social sciences, 38 percent; and agricultural sciences, 27 percent (figure 2).

The Federal share fell over the entire 1973–2000 period for all of the fields examined, with most of the decline in all of these fields occurring during the 1980s (figure 3). During the 1973-1980 period, there were slight increases in the Federal share for some fields and decreases in others. In the 1990s, the Federal share rose for social sciences and psychology, declined for mathematics and medical sciences, and stayed roughly even for the remaining fields. The decline in the Federal share for medical sciences occurred during a period in which the R&D budget of the National Institutes of Health (the largest Federal source of academic R&D funds) was increasing much more rapidly than the R&D budgets of other Federal agencies; this indicates that non-Federal sources of medical science R&D at universities and colleges were increasing their funding faster than was the Federal Government.

The most dramatic declines in Federal shares over the entire period—in both absolute and relative terms—occurred in social sciences (57 percent in 1973 versus 38 percent in 2000) and engineering (71 percent to 56 percent). The smallest decline was in computer sciences (70 to 66 percent).

In terms of actual (constant) dollars received by academic institutions, support from both Federal and non-Federal sources increased during the overall period for each one of the fields examined in this InfoBrief. Support from these sources also increased in each of the three decadal periods for almost all fields (table 2). In the social sciences, the level of Federal support fell in both the 1970s and 1980s and the level of non-Federal support declined in the 1970s. Federal support for psychology also decreased in that decade as well as non-Federal support for the biological sciences.

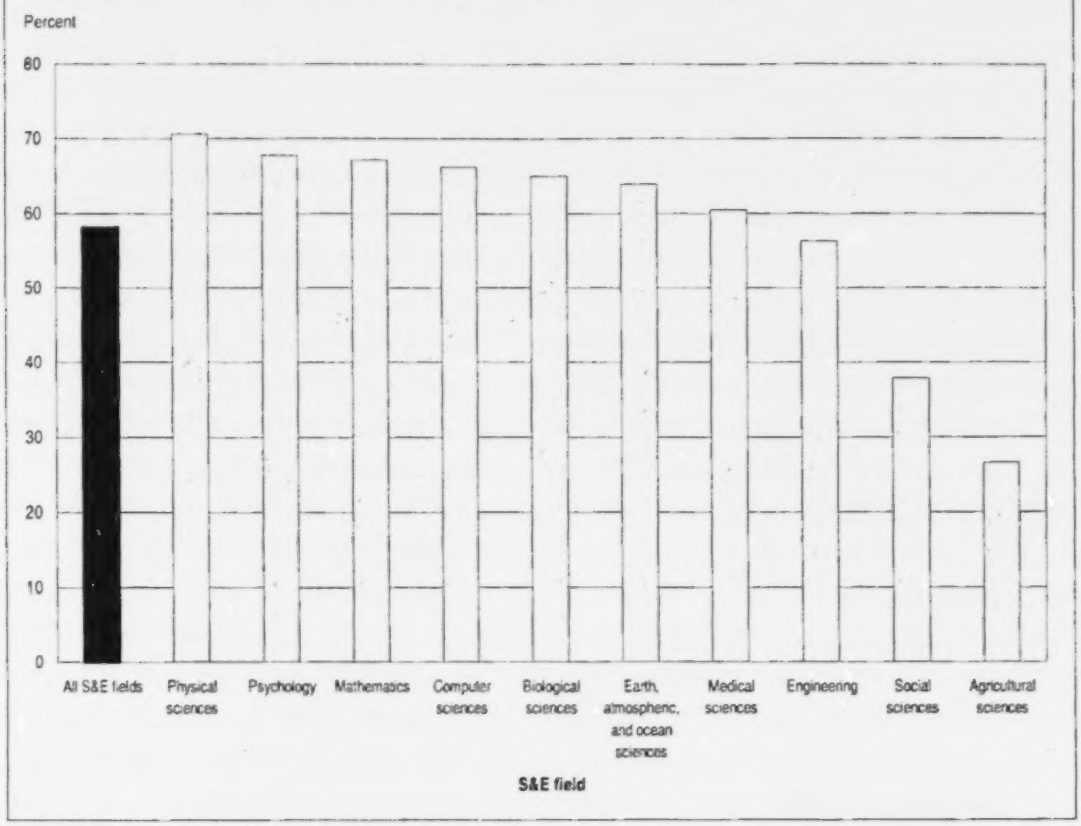
[5]Data on funding source by S&E field for the four non-Federal sources discussed above are not available; instead, data are provided here for the combined non-Federal total. These data were unavailable before 1973.

Table 2. **Academic R&D from Federal and non-Federal sources, by field**

Year	All S&E fields	Engineering	Physical sciences	Earth, atmospheric, and ocean sciences	Mathematics	Computer sciences	Agricultural sciences	Biological sciences	Medical sciences	Psychology	Social sciences	Other sciences
	(Millions of constant 1996 dollars)											
	Funds from Federal sources											
1973	5,909	709	799	469	86	74	281	1,186	1,447	174	394	185
1974	5,549	654	738	460	80	78	277	999	1,485	160	374	131
1975	5,716	648	712	451	78	85	282	1,142	1,533	154	353	143
1976	5,938	687	722	501	78	78	290	1,234	1,602	140	327	141
1977	6,055	748	753	530	90	83	295	1,277	1,582	141	307	129
1978	6,342	845	813	570	91	85	322	1,224	1,710	133	291	140
1979	6,886	1,020	940	629	116	133	346	1,268	1,757	138	297	140
1980	7,185	1,037	973	651	107	153	366	1,334	1,856	141	320	137
1981	7,329	1,062	992	627	109	167	376	1,392	1,906	148	300	131
1982	7,197	1,043	981	590	108	183	365	1,387	1,890	134	244	133
1983	7,244	1,067	1,016	619	111	202	380	1,432	1,831	130	213	126
1984	7,602	1,104	1,095	624	129	228	376	1,531	1,923	137	200	122
1985	8,230	1,177	1,208	643	132	266	399	1,642	2,139	144	209	125
1986	8,912	1,298	1,305	686	152	309	388	1,742	2,313	151	230	143
1987	9,465	1,434	1,355	703	170	332	384	1,830	2,529	160	217	148
1988	10,214	1,533	1,444	734	187	360	402	2,005	2,759	175	236	151
1989	10,797	1,662	1,438	782	189	389	420	2,085	3,005	184	255	153
1990	11,141	1,764	1,520	788	186	396	408	2,132	3,088	189	261	160
1991	11,414	1,827	1,543	782	190	414	421	2,175	3,177	208	282	125
1992	12,078	1,908	1,607	862	200	414	455	2,327	3,390	234	306	111
1993	12,713	1,976	1,608	925	216	450	479	2,457	3,583	249	360	137
1994	13,171	2,076	1,628	983	214	481	514	2,538	3,684	251	373	150
1995	13,586	2,142	1,669	980	209	493	542	2,537	3,901	254	395	195
1996	13,835	2,232	1,630	1,006	208	501	560	2,528	4,024	258	423	173
1997	14,035	2,213	1,650	992	198	497	538	2,631	4,146	266	401	205
1998	14,674	2,281	1,706	1,042	207	497	517	2,844	4,418	289	412	167
1999	15,356	2,331	1,777	1,052	200	556	521	3,072	4,645	296	451	147
2000	16,343	2,394	1,786	1,057	214	543	540	3,406	5,086	327	458	165
	Funds from non-Federal sources											
1973	2,674	283	178	154	25	32	543	470	475	45	294	130
1974	2,705	294	173	182	22	29	672	395	471	43	283	98
1975	2,799	304	163	186	21	29	677	432	494	47	287	107
1976	2,877	334	175	181	23	27	686	446	520	44	293	96
1977	2,978	359	188	179	26	40	728	438	530	48	288	106
1978	3,247	401	216	216	30	54	760	452	630	53	284	101
1979	3,384	465	213	237	33	54	799	478	629	53	264	115
1980	3,444	474	215	239	30	64	819	468	638	51	275	119
1981	3,649	488	236	255	31	64	890	515	668	56	288	101
1982	3,857	509	263	252	37	64	919	555	735	63	290	102
1983	4,199	563	291	277	43	69	958	629	826	67	288	113
1984	4,465	620	306	279	43	86	959	672	923	66	302	129
1985	4,916	747	350	314	42	115	957	775	1,006	71	311	128
1986	5,598	881	404	344	49	118	1,058	842	1,160	75	365	160
1987	6,199	1,004	447	378	58	148	1,061	934	1,338	82	430	182
1988	6,570	1,080	494	380	61	148	1,064	997	1,452	91	453	210
1989	7,189	1,211	540	425	69	179	1,119	1,085	1,580	97	505	229
1990	7,685	1,307	568	448	70	199	1,151	1,173	1,714	103	551	228
1991	8,199	1,415	619	466	66	204	1,205	1,242	1,894	108	555	245
1992	8,412	1,426	631	490	70	191	1,191	1,270	2,015	124	581	232
1993	8,500	1,380	657	477	73	196	1,178	1,303	2,078	123	593	254
1994	8,725	1,418	640	471	80	192	1,217	1,325	2,188	123	620	255
1995	9,008	1,441	630	481	75	203	1,308	1,371	2,287	124	643	239
1996	9,204	1,475	627	482	80	188	1,350	1,381	2,367	123	674	244
1997	9,861	1,553	674	510	86	199	1,391	1,469	2,630	122	703	299
1998	10,370	1,662	698	531	93	226	1,417	1,594	2,822	141	684	267
1999	10,950	1,741	711	564	99	266	1,424	1,738	3,008	148	747	282
2000	11,742	1,857	742	596	105	277	1,495	1,834	3,325	155	753	326

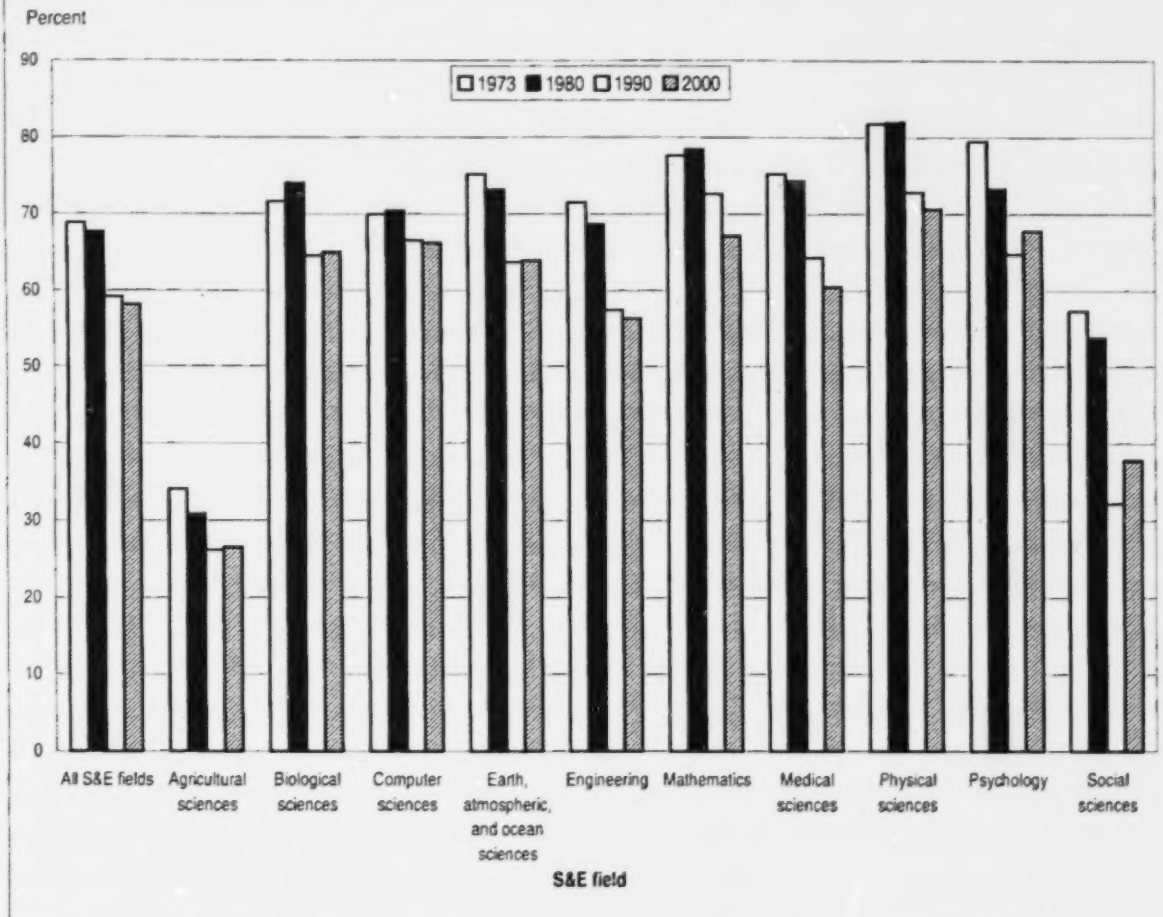
SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, various years.

Figure 2. **Share of academic R&D expenditures from the Federal Government, by field: 2000**



SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, various years.

Figure 3. **Share of academic R&D expenditures from the Federal Government, by field**



SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, various years.

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